# SEASONAL SUCROSE METABOLISM IN INDIVIDUAL FIRST-ORDER LATERAL ROOTS OF NINE-YEAR-OLD LOBLOLLY PINE (*Pinus taeda* L.) TREES

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Loblolly pine seedlings have distinctive temporal and spatial patterns of sucrose metabolism and growth with stems and roots as the major sucrose sinks, respectively, from spring to mid-fall and from mid-fall to early winter. Both nursery-grown and outplanted seedlings up to the age of 3 years followed this pattern. However, there have been no reports on the seasonal or spatial patterns of sucrose metabolism pathways in older loblolly pine trees. The objectives of this study were: 1) to identify the dominant sucrose metabolism pathway in cambial tissues of 9-year-old loblolly pine tree stem, taproot, and first-order lateral roots; 2) to verify the seasonal and the spatial patterns of sucrose metabolism in loblolly pine trees; and 3) to deduce the importance of individual first-order lateral roots.

From May 1994 to January 1995, trees with various stem diameters from a 9-year-old artificially regenerated loblolly pine plantation were sampled monthly for biomass and sucrose metabolizing enzyme activities. Trees were excavated with a commercial tree spade. Taproot and first-order lateral roots within the root cone (1.22 m x 1.37 m) were washed free of soil and sampled for cambial tissues. Stem cambial tissues were sampled from near ground and from breast height. Each lateral root was analyzed individually. Similar to seedlings, stems and taproots of these trees have sucrose synthase (SS) as the major sucrose cleaving activity and both PPi-dependent and ATP-dependent phosphofructokinases are active in the growing season. The periodic sucrose metabolism between stem and taproot of an individual tree followed a similar seasonal pattern to that of seedlings. The highest levels of SS activity were found in stems and taproots during September. Stem SS activity disappeared after October whereas taproot still had some SS activity even in December. Generally first-order lateral roots were as active in sucrose metabolism as stems and taproots from June to October. However, individual lateral roots of the same tree were not synchronized in sucrose metabolism. Even during the most active months, regardless of the diameters, some first-order lateral roots were low in SS activity. The quiescence of these roots could then affect functioning of their higher-order feeder roots. The individuality of tree first-order lateral roots need to be noted when only a few lateral roots are sampled for analysis. When strong competition for sucrose occurs between different organs of a tree, the non-synchronization of lateral roots in sucrose metabolism could be the strategy a tree uses to ensure that enough sucrose is allocated to stem and taproot for growth. In other words, second or higher-order feeder roots can be sacrificed but the taproot and first-order lateral roots can not.